Warren King Charcoal Kilns
(Birch Creek Charcoal Kilns)
Forest Road 188, Targhee National Forest
Leadore Vicinity
Lemhi County
Idaho

HAER No. ID-11

HAER
ID,
30-LEDO.V,
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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service, Western Region
Department of the Interior
San Francisco, California 94102

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HISTORIC AMERICAN ENGINEERING RECORD

WARREN KING CHARCOAL KILNS (Bireh Creek Charcoal Kilns) HAER No. ID-11

Location: Forest Road 188, Targhee National Forest
5.0 miles west of Idaho Highway 28
22 miles southeast of Leadore
Lemhi County, Idaho

U.S.G.S. 15 minute Nicholia, Idaho-Montana quadrangle, Universal Transverse Mercator coordinates: 12.326300.4908350

Date of Construction: 1886

Builder: Warren King

Present Owner: U.S.D.A. Forest Service, Intermountain Region
Targhee National Forest
420 N. Bridge St., St. Anthony, Idaho 83445

Present Use: National Forest interpretive site

Significance: The Warren King Charcoal Kilns are representative of a transitional stage in the technology of charcoal manufacture, between traditional charcoal pits and wood distillation plants. Their technology was uniquely adapted to the needs of the nineteenth-century mining industry of the western U.S. The kilns are also associated with, and representative of, a transformation of that industry, from one based on rich precious-metal placers and lodes to one based on the extraction and efficient treatment of large volumes of base-metal ores. The kilns were listed in the National Register of Historic Places in 1972.

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Date: November 28, 1989

INTRODUCTION

Charcoal is the residue of solid non-agglomerating organic matter, of vegetable or animal origin, that results from carbonization by heat in the absence of air at a temperature above 300 degrees celsius.[1] During the nineteenth century, it was commonly used as a smelter fuel to treat ores from western mines. Charcoal required less blast and had a higher porosity than coke, the principal alternative fuel, and was generally more convenient and less costly to obtain. It was also a good reducing agent for the ores.[2] The Warren King Charcoal Kilns were built in response to local demand for smelter fuel in the mid-1880's.

DESCRIPTION

The King Charcoal Kilns consist of four free-standing parabolic brick domes extant from an original sixteen (see photos 1 and 2). Two retain their original parabolic profile, while the other two have experienced collapse of all or part of the upper dome sections. Circular depressions between the remaining kilns mark the missing structures.[3]

The kilns are located in a small draw on the east side of the Lemhi Mountains, in Lemhi County, Idaho (Map 1), and were built on a shelf cut into the slope of the draw (Map 2, also see photo 3). The interior diameters of the extant kilns average 21 feet. Those which retain all or a portion of their domes average 21.5 feet in height above present grade. Two major openings were designed into each structure. A 5-foot high, arched, main opening is centrally located on the downhill side (see photos 4 to 7). It is elevated approximately 18 inches above the exterior grade, and is now flush with the interior floor. The interior floor consists of compacted ash and charcoal from kiln operation. On the uphill side, a smaller arched opening is present, 13.5 to 14.0 feet above the original grade (see photos 3, 8 and 9). Three rows of draft holes encircle the kilns (see photo 7). They start 6 inches off the floor, are 2 feet apart on the horizontal and 18 inches between rows. On the uphill side, these holes are all below the current grade, indicating that the kilns originally sat on a level shelf.

The kilns are built of a low-fired, high percentage clay mixture. Bricks examined ranged from 2.25 to 2.75 inches high, 4.25 to 4.75 inches wide, and 9.0 to 9.5 inches long. Color ranges from a light buff to a deep reddish brown. As the structures rise from the ground, the walls grow thinner. At the base, and extending 18 inches above the inferred grade, the walls are 4 wythe thick. With a series of 1-inch corbels, the walls thin to 3 wythe on the main vertical sidewalls, which rise 13.5 to 14 feet from grade. At this height the walls thin to only 2 wythe with the creation of a small shelf, and then continues to form the dome. Over the majority of the dome, individual bricks and mortar joints can readily be seen on the surface. Evidence of a thin render can be seen in sheltered locations. This is difficult to recognize, as it is covered with a coat of weathered brick washed down from the upper portions of the domes. Brick dust can be removed from the walls with a medium bristle fiber brush, and a yellowish-white coating over the brick can clearly be seen. The texture of the surface suggests application with a large brush or gloved hand.

Encircling three of the four kilns (the northern group) are heavy wire ropes pulled tight by a bolted plate buckle. One kiln has three ropes, and the others have only two. These ropes are original, as they appear in early photographs of the kilns, and the render contains impressions of the wires (see photos 1, 5 and 6).

Other features present on the site include the trace of a road, a pile of badly deteriorated brick, and several piles of rotting Douglas-fir cordwood (see photo 11). The road runs from the bottom of the draw up the side behind the southernmost kiln. The wood lies primarily to the west of the kilns. The site area is approximately 10 acres.

HISTORICAL BACKGROUND

The 1880's saw a conjunction of events that led to the rapid development of lead/silver ore deposits in Idaho. Depletion of gold ores, advances in smelting technology and the growth of rail transport resulted in the establishment of major mines in the Wood River and Coeur d'Alene regions.[4]

Less-known than Wood River or Coeur d'Alene, but no less a part of this phase of Idaho mining, are the Birch Creek mines of eastern Idaho. The Viola Mine was the most productive, yielding about $2,500,000 worth of lead and silver between 1883 and 1888.[5]

The Viola is said to have been accidentally discovered by a horse wrangler in 1881. He sold the property to one "Cap" Rustin of Omaha, who did some development and shipped ore to Omaha for smelting. Rustin then sold the mine to investors from Leadville, Colorado. These investors continued to ship small quantities of ore by rail until a smelter could be constructed to serve the mine.[6] Throughout this period, reports about the mine were enthusiastic:

> "About 20 miles across the valley is the wonderful Viola, located at the foot of the mountain, where a team can be driven to the mouth of the tunnel. This is one of the most wonderful deposits in the country. The vein is of immense width, and the ore is shoveled into sacks and shipped to New York where from $30 to $50 per ton is realized after all expenses are paid. They are now shipping from 50 to 70 tons per week."[7]

> "The Viola mine is located about two miles east of the town of Nicholia. The mine is operated by an Omaha company, with Ralph Nichols as general superintendent. The company has $250,000 invested in a half interest in this mine. It is estimated that there are 40,000 tons of ore developed in the mine. In a short time the company will commence the shipment of 180 tons of ore per week to Camas station on the Utah and Northern Railway. On the mine there are hoisting works. The deepest shaft is down about seventy feet. Ore from the Viola will be shipped to Omaha. This property is looked upon as the big bonanza of Eastern Idaho."[8]

Reports remained favorable in 1885, and by then a smelter was under construction:

> "At the extreme north end of Birch Creek valley lays the town of Nicholia, built up by the business created by the Viola mine, an immense deposit of sand carbonate varying on an average 60 per cent lead and 40 to 60 ounces in silver.
>
> ... The Viola mine, under the superintendance of Mr. Frank [sic] Nichols, is at present working but few men, and they are cutting a tunnel through quartzite for the purpose of building a tramway to run the ore down the hill to the smelter, which will be erected some time during the season. It is estimated that it will take thirty men five years to remove the ore now in sight.... The proposed smelter will be two stacks, and will employ about 15 men."[9]

The smelter had a capacity of 80 tons of ore per day.[10] The remoteness of the Viola, which meant hauling ore 65 miles to the railroad before it could be shipped to New York or Omaha, was the biggest problem facing the mine owners. The solution was the establishment of a smelter near the mine. The smelter reduced the ore to produce metallic lead and silver. Ore, flux and fuel were layered into a blast furnace from a charging door located several feet above the base.[11] (Flux consisted of limestone and iron ore, needed to support the chemistry of the reduction reaction.)

Smelter fuel might consist of coke, charcoal or a combination of both. Coke resisted crushing by the weight of the charge. Crushing would result in reduced heat and increased flue dust. Charcoal had higher porosity than coke, required less blast, and was a good reducing agent for the ores. Both were frequently combined to take advantage of their complementary properties.[12]

An article in the Dillon Tribune described the smelter as it neared completion in 1885:

> "The smelter is located at a convenient site a short distance from the town of Nicholia. It is one patterned after the Kansas City smelter. The water-jacket furnaces, two in number, are 60x42 inches at the tuyere. Each furnace will have a daily capacity of reducing forty tons of ore. The building, now being erected, will be large enough for stacks, its dimensions being 184 feet. M. E. Smith, lately of Kansas City, is putting in the plant. It is modeled in excellent shape and is of a very substantial character. It is confidently expected that the furnaces will be fired up and in active operation by November 1. The machinery for two stacks is all that can be placed in operation this fall. Two boilers, 64 inches in diameter by 16 feet in length, will provide the steam for a Westinghouse engine of sixty horsepower, which will drive the machinery. When ready to start up, the Viola Company will be prepared to purchase ores offered at the smelter. The plant going in will compare favorably with the best plants now in successful and steady operation in Montana."[13]

The King kilns apparently had no role in fueling the smelter in 1885. The Viola Company was reported to be building three large charcoal pits in Willow Creek in late fall of that year, and it was not until 1886 that six brick kilns were reported under construction.[14] In October of 1886, King was referred to as "the coal contractor," in a report that he had failed to deliver charcoal because of a snow storm, requiring the smelter to "call on parties who had pit char coal."[15]

Following completion of the smelter, the Viola Company, Limited was organized in London to assume control of the mine. It was capitalized at £150,000. The Engineering and Mining Journal reported that:

> "the vender [sic] has guaranteed that the bullion unrealized, working stores, and cash standing to the credit of the company at its bankers amounted on that date [August 1, 1886] to

> £25,000. This amount, it is expected, has been considerably increased, as the weekly reports are of a very favorable character. The plant, which has cost more than £20,000, consists of two large smelting furnaces, machinery and buildings, boarding-houses, ore coke houses and fuel sheds, offices, tramway, telephone line of 60 miles in length [to the railway at Camas], and every thing complete for the transaction of a large business. The ore is carbonate of lead, containing from 37 to 58 per cent of lead, and from 4 to 15 ounces of silver a ton. Messrs. John Taylor & Sons, the well-known mining engineers of London who examined this property in May last, report the quantity of reserves actually in sight to be upward of 28,000 tons, of an average assay per ton off 44.92 per cent lead and 6.54 ounces silver. The net earnings for the eight months ended September 1st are said to have been $129,175.41. Will some correspondent who knows the property tell us its value?"[16]

The request for information drew the following response:

> "The Viola mine is located at Nicholia, Lemhi County, Idaho, sixty-seven miles northwest from Camas, a station on the Utah and Northern Railroad. There is a good road from Camas, with stage daily except Sunday. The condition of the road is apparent from the freight charges, which are $9 a ton from Nicholia to Camas, and $6 a ton for return freight. To facilitate communication, the works are connected with Camas by a telephone line owned by the company.
>
> The mine is dry, and is worked by means of a tunnel, obviating all expense for hoisting and pumping machinery. From the mouth of the tunnel, the ore is delivered to the works by a Hallidie tramway, 7860 feet long, having an average grade of about 11 degrees.
>
> The smelting plant is very complete, including duplicate engines and blowers, and two furnaces built on the model of those used at Kansas City. Cost of coke, $22 a ton, and charcoal 11 cents a bushel, delivered at the works. Previous to October, 1885, the company shipped between six and seven thousand tons of ore, averaging 50 to 60 per cent lead, and from 10 to 12 ounces silver, to Kansas City and Omaha.
>
> The first stack was blown in October 25th, 1885, and the second December 11th, 1885.

> The production since October 25th, 1885, to October 31st 1886, has been as follows: 118,200 bars; 175,447.80 ounces silver; 12,298,958 pounds lead.
>
> Since Messrs. Taylor & Sons examined the property, a new body of ore has been opened about 40 feet below the workings at that time, which has largely increased the value of the property.
>
> The ore is easily mined and smelted, requiring little or no flux, and it will be seen from the figures given above that a good margin of profit can be made under these conditions on an ore of from 40 to 50 per cent lead and 10 ounces silver per ton. Yours truly, ARTHUR THACHER, NEW YORK, NOV. 23 KEMPTON & THACHER, 61 Broadway, New York."[17]

In a note added to Thacher's letter, the editor of the Journal offered a comment: "The ore is contained in limestone, and, as is usual in such deposits, the quantity in sight is small and uncertain."[18] That drew a response from Ralph Nichols: "The information you have concerning this property must have been gathered from some one who had no knowledge of it."[19] Nichols contested the characterization of the ore as occurring in pockets, and countered that although the ore was not regular in thickness, but was continuous along the vein.

Nevertheless, the Viola mine has been cited as one example of a pattern of victimization of British investors.[20] The Viola Company began by paying large dividends: a quarterly dividend on the basis of 20 per cent per annum. Dividends were paid in 1887 and in 1888. In March of the latter year, the Mining and Scientific Press carried a report that cumulative production totalled 75,000 tons of heavy carbonate ore, with about 100 tons being smelted daily and yielding about 40 tons of lead/silver bullion. The correspondent, Charles F. Blackburn, estimated that a year's run of ore was in sight.[21] Blackburn proved to be less of a prophet than the editor of the Engineering and Mining Journal. In the meantime, in April of 1888, the Idaho Recorder reported gross weekly earnings for the mine of $19,000 and net earnings of £17,923 in less than three months.[22]

The day of reckoning arrived on November 12, 1888. The smelter received orders to shut down. These were attributed to the result of the Presidential election of that year, and its anticipated effects on the tariff on lead ore.[23] That is possible, as lead-silver ores were being allowed to enter the U.S. duty-free if the value of silver in the ores exceeded the value of lead. However, that is unlikely to have been the sole cause of the shutdown. The quality of the ore from the Viola was also declining.

An article in the Engineering and Mining Journal of the preceding August reported high smelting costs, resulting from the necessity of using large amounts of flux on the ore. The payroll was said to be less, and less fuel was being used, but:

> "the low price of lead, small amount of silver in bullion, together with the fact that we are now compelled to use such a large quantity of lime and iron to flux the ore, has greatly reduced the profits."[24]

The last dividend was paid to stockholders in November 1888. The price of lead collapsed, the hoisting works burned and the valuable ore played out.[25] Reports that the mine had substantial ore remaining and that the smelter would be re-started[26] seem to have been attempts to stave off creditors, or to encourage additional investment, and at least one was labelled a "canard" [27] By November 1889 the Viola Company had been reorganized, and in 1894 the Idaho operations were abandoned. Although $337,500 were returned in dividends, the English investors had only recovered one-third of their money. They decided that they had been "humbugged", as the mine had played out so suddenly.[28]

They were not the only ones surprised. A photograph believed to have been taken in the 1890's (photo 1) shows a considerable quantity of wood stacked behind the King charcoal kilns, some of which remains today. Evidently, King had not had an opportunity to eliminate his stockpile prior to shutdown. W. J. King was reported delinquent in property tax payments on the kilns in 1888, and "J. W. King" as delinquent in 1891 and 1892. Their value is given as $2300 in 1888 and $500 in 1891 and 1892.[29] The shutdown of the smelter marked the end of the King kilns' useful life, unless one includes their reputed use to hide moonshiners' stills during Prohibition. The illicit use is said to have involved the building of an upper floor to ferment the mash, while the ground floor was used for distilling.[30] No trace remains of such activities, however. The missing twelve kilns were dismantled over the years by farmers and ranchers salvaging the brick.

KILN OPERATION

Contemporary descriptions of charcoal production at the King kilns are limited. The Idaho Register reported that six were under construction in July, 1886.[31] The date of construction of the remaining kilns is unknown. Letters to area newspapers provide a few details about the kilns' operation:

> "The Viola Company uses from 50,000 to 60,000 bushels of coal per month. Mr. W. C. King furnishes from 44,000 to 50,000 bushels which is charred in 16 kilns situated around the valley, 12 miles distant. The Italians furnish the balance which is charred in pits."[32]
>
> "Woodland, ten miles west across the valley from Nicholia, is a new camp and has a population of about 150 men, who are engaged in the coal business, some in hauling wood to the kilns, others burning the coal and still others loading and hauling the same to the smelter at Nicholia.
>
> W. E. King took the contract for five years time and this is the third year. The price is 13 cents per bushel delivered. There is on hand about 6,000 cords of wood. The coal is burnt in 16 kilns with a capacity of 30 cords of wood each which produce 2,000 bushels of coal. This amount takes two days time to burn, and one kiln is discharged each day. This hauled in wagons with racks about four feet high, and each rack holds 400 bushels, and they haul two wagons with a six-horse team.
>
> Mr. King manages the work personally and W. H. Johnson is the superintendent. The business alone is an immense one and great expense is attached to it, still we learn that Mr. King with his strict attention to business is doing well.[33]

The time quoted in the latter article for burning the charcoal is at variance with other accounts of the charcoal-making process, which give six days to three weeks as the time required for burning and cooling the charcoal from kilns of comparable size.[34] If the article is accurate about the capacity of the kilns, and the number of kilns discharged per day, it would permit the kilns to deliver the stated monthly quantity of charcoal with a two week production cycle.

Other contemporary references to the kilns provide additional estimates of the number of men employed in the business:

> "There are about 200 men and a large number of teams employed in the wood and coal camps, this being nearly all contract work."[35]

An 1888 report suggests a lower number engaged in charcoal production, as it includes the miners and smelter workers as well:

> "About 200 men are employed mining, smelting, freighting, burning charcoal and chopping wood. Wages average $3 per day."[36]

The reason for the discrepancy in the reports is unknown, but estimates that charcoal production employed 150 to 200 men seem reasonable, since there are yet other reports indicating that there were at least 30 woodchoppers.[37]

Further statements about kiln operation, and functional inferences regarding the features noted in the site description, must be based upon analogy with comparable structures in other localities. Notarianni[38] quotes 1880 census data not available to this author. They describe charcoal kilns at Frisco, Utah that furnish the necessary analogies:

> "The kilns are made of granite float found in the neighborhood and a lime mortar. They are of various sizes, from 16 to 26 feet in diameter. It is the rule in this section to make the height of the kiln equal to the diameter. The thickness varies from 18 to 30 inches at the base and from 12 to 18 inches at the summit. There are two openings, closed by sheet iron doors, one at the ground level, 4 by 6 feet, and the other in the side two-thirds of the distance to the apex, 3 by 4 feet. There are also three rows of vent holes, 3 by 4 inches, near the ground. The lower row is at the surface of the ground. The rows above are 18 inches apart, having vent holes 3 feet apart in each row. The kilns cost from $500 to $1,000 each, and last a very long time if used regularly. The 16-foot kiln holds about 15 cords of wood and the 26-foot kiln 45 cords. Sometimes the wood is piled radially, but generally very closely in cord-wood fashion. The wood is all pinon pine, and is cut at all seasons by Mormons at $1.25 per cord. It is brought from 1 to 4 miles by sledges or wagons to kilns for from $1.50 to $2.50 per cord. The kilns are fired in the center at the bottom (though

sometimes at the top), and the fire is drawn to the top by leaving a small unsealed space around the upper door. This is then closed entirely, and the fire is regulated by the vent holes. The duration of burning is from three to seven days, and of cooling from three to six days. Charring, which includes packing the wood in the kiln and drawing the coal, is usually done by contract, and costs from 2 3/4 to 3 1/2 cents per bushel. About 50 bushels are produced per cord charred. The coal is bought by weight, 17 pounds making a bushel. It is shipped to the smelters in racks, at a cost of from 3 to 5 1/2 cents per bushel for hauling, depending on the distance. The price received is 18 cents per bushel. Kiln hands are paid from $2 to $2.75. The labor required averages one man per kiln per twenty-four hours."

The population schedule for Frisco provides some insight into the characteristics of the charcoal producers.[39] There were five kilns present, and the census enumerates 4 coal contractors, 21 coal burners, 7 stonemasons, 1 brickmason, 2 wood contractors and 5 woodchoppers. The average age of the coal contractors was 42 while the coal burners averaged 27 years of age. Fourteen of the coal burners were single men, and most of them resided in multi-family households, probably boarding houses. The coal burners were exclusively from the United States or northern Europe. The last sentence contrasts with the situation alleged for the King kilns, where it is asserted that the work was performed by Chinese and Italians as well as Irish and Scots.[40] The 1890 census records that might have provided the data for the King kilns were destroyed by fire.

The closest known modern parallels to the King kilns are Argentine "half orange" kilns.[41] Fuelwood is cut into 1.0 to 1.3-meter lengths, transported to the kiln site and air-dried for five to six weeks. In charging the kiln, stringers are placed on the kiln floor to allow free circulation of air from the inlet holes through the center of the kiln. Logs are stacked vertically on the stringers and packed as tightly as possible, and are then stacked horizontally on top of the vertical logs until the ceiling is reached. The wood is ignited, and the ignition port is kept open until the smoke color changes from bluish to white, indicating that the wood is beginning to lose moisture. The ignition port is then sealed. After several hours, the white smoke issuing from smoke ports and air inlets will turn blue again, at which point those openings are sealed. After the last air inlet at the bottom of the kiln has been sealed, the cooling phase begins. It is important that the kiln be kept airtight during the cooling process, otherwise the charcoal starts to burn. Therefore, the surface is kept coated with a mud slurry. When the kiln has cooled sufficiently, the door may be opened and the fire extinguished with water, at which time discharging begins. The charcoal is then hauled to a curing area. Fresh charcoal absorbs oxygen readily, with an accompanying rise in temperature that may cause spontaneous ignition. Until the curing process is completed, charcoal cannot be handled or transported in large quantities.

SIGNIFICANCE

Parabolic masonry charcoal kilns constitute a transitional charcoal manufacturing technology, between charcoal burning in pits and and wood distillation plants. First introduced in 1868, they had largely gone out of use in the U.S. by 1920.[42]

Traditional methods of charcoal manufacture employ pits or earthmound kilns.[43] There are many variants of the charcoal pit or earthmound kiln. The basic principle of the pit is to excavate a chamber in the ground, and lead air from one end to the other along the bottom. Therefore, bedlogs are laid in the bottom of the pit to form a crib on which the charge will be placed. When the charge has been placed and lighted, the incoming air, mixed with hot gases, will travel beneath the charge, heat it to carbonization temperature, and leave through a flue on the opposite side. The pit is covered with a layer of leaves and soil. The resulting charcoal is usually of poor quality. Because it is difficult to control the internal airflow, and thus the temperature, much of the fuelwood may be burned to ashes or only half burned. The charcoal also tends to become contaminated with soil upon uncovering. In addition, the operation requires careful attention by the operator to assure that cracks do not develop in the covering and result in uncontrolled airflow.

In the case of the earthmound kiln, the site is first prepared by clearing, levelling and compacting the ground. Posts may be erected to stabilize the wood pile. A grid of logs is laid out on the ground to provide airflow, and the fuelwood is stacked on this platform. A cover of leaves and soil is placed over the pile. Earthmound kilns suffer from some of the same problems as pit kilns, especially contamination of the charcoal and the need for constant attention during the burning and cooling.

Pits and earthmound kilns also waste valuable by-products of the carbonization process. In the seventeenth century it was discovered that acetic acid was a component of the liquid by-products, known as "pyrolysis oil". This drew the attention of the chemical industry to charcoal manufacture as a source of raw materials. Traditional methods of charcoal manufacture did not permit the production of the desired quantities of pyrolysis oil. This in turn led to development of metal retorts and ovens for the heating of wood and recovery of the liquid and gaseous products of carbonization. The process is referred to as "distillation". Early examples heated individual batches of wood, while modern ovens can be fed continuously.[44]

Distillation offers many advantages over traditional methods of charcoal manufacture. The charcoal will not be contaminated with soil; air and heat can be supplied in a uniform manner; and since the range of products is increased, so are profits. Consequently, industrial charcoal production now generally employs distillation.

Masonry kilns of the type constructed by Warren King offered some of the advantages of retorts or ovens. It was less likely that cracking or collapse of the covering material would lead to complete combustion and loss of the charge, and it was less likely that the charcoal would be contaminated when the kilns were opened. Since air inlets were permanent fixtures, it is also likely that air flow and combustion were more predictable than with traditional methods, where the inlets might be rebuilt, repositioned or replaced with each load.

On the other hand, masonry kilns did not allow for the recovery of pyrolysis oil.[45] This was not a disadvantage in the context in which they were constructed. The King kilns were typical in this regard. They had only one customer, the Viola smelter, and that customer needed only one product, fuel. Pyrolysis oil was superfluous, and hence a more advanced method of manufacture could be foregone. This seems to have been true of most charcoal manufactures supplying western mines, and hence the masonry kiln was the usual type found in mining camps.[46]

Western mining was itself undergoing a phase of transition during the period in which the King kilns were in use. The California gold rush initiated an era of intense activity, focused on precious metals. Technology was crude, however, and even when the capital-intensive lode mines of the era are considered, mining was limited to the highest-grade ores

By the 1870's, western miners were encountering increasing difficulty in coping with the ores they were locating. The lead-silver ores of the Rockies and Great Basin could not be treated with the relatively simple methods such as crushing and amalgamation used to treat gold. Smelting was required, and until the ores had been correctly identified and proper treatments developed in Nevada and Colorado late in the decade, little progress was made. Further, until railroad transportation was available, it was economically impossible to bring fuel and fluxes to the mining camps, or to ship out the base-metal products of the ores.[47]

Idaho presents a typical case.[48] Poor transportation frustrated lode mining following the decline of early, rich placers. Once the Utah and Northern, Oregon Short Line and other railroads had been completed across the territory, rushes to the Wood River and Coeur d'Alene country followed. Working of the Viola mine would likely have been impossible without the existence of the Utah and Northern, although it was certainly a problem to have the nearest siding over 60 miles from the mine. By reducing the need for imported fuel, the King kilns eased the difficulty.

This shift in focus, from gold and silver ores to ores that were at least as valuable for their content of base metals such as copper, zinc and lead, marked the first step in the development of modern western mining patterns. The stability of the industry ultimately came to depend upon the base metals. The second step came at the end of the nineteenth century, when electricity and new chemical processes made it profitable to treat huge volumes of ore to extract small unit quantities of metal. This is the pattern exemplified at mines such as Utah's Bingham Canyon copper mine. Organized in the early twentieth century, the Bingham Canyon mine has since removed over 16 billion pounds of copper.[49]

The ores of the Viola Mine were more valuable for their lead than for their silver, and thus the Viola was part of the first step in the development of the modern western mining industry. As such is an element of a pattern which also included the better-known mines of Idaho's Wood River and Coeur d'Alene areas.

The King kilns are associated with this step, and form a physical link to this aspect of western history. They result from, and represent, the metallurgical and transportation problems encountered by miners extracting and treating base-metal ores, and form a memorial to a period when the Birch Creek Valley seemed as likely to achieve greatness as Wood River or Coeur d'Alene.

Recognizing their significance, the Targhee National Forest maintains the kilns as a picnic area and interpretive site, and in 1984 began a stabilization program designed to carry the kilns into a second century of existence. A moisture-resistant render cap was established on the northernmost kiln in that year.[50] In 1986, temporary roof supports were installed in the interior of the southernmost kiln, and in 1987 concealed concrete footings were placed under the front of the same kiln.

NOTES

1. Walter Emrich, Handbook of Charcoal Making (Dordrecht: D. Reidel Publishing, 1985), 13.

2. A Conservation Study, Birch Creek Charcoal Kilns, Targhee National Forest (Boise: Idaho State Historical Society, 1984).

3. The description which follows is taken from Frank A. Fiori and Frederick L. Walters, "Stabilization of Brick Charcoal Kilns in Birch Creek, Idaho," APT Bulletin 21, nos. 3/4 (1989): 17-18.

4. Merle W. Wells, Gold Camps and Silver Cities (Moscow: Idaho Department of Lands, Bureau of Mines and Geology, 1983), 112-132.

5. Wells, Gold Camps, 127-128.

6. Ralph Nichols, "Autobiography of Ralph Nichols" (Dubois: Dubois Ranger District, undated photocopy); Wells, Gold Camps, 127.

7. The Viola was located "across the valley" from the Texas District, the most active local mining district in 1883. The article should not be taken entirely at face value, as the mine was located in a saddle at 8720 feet elevation. "Texas District," Blackfoot Register, 18 August 1883.

8. "The Big Viola Mine," Dillon Tribune, 5 April 1884.

9. "Nicholia, the Camp at the Foot of Viola Hill," Idaho Register, 27 June, 1885.

10. "Camas Notes," Idaho Register, 15 August 1885; "Grip-Sack Correspondence," Dillon Tribune, 8 September 1885.

11. For a description of a contemporary blast furnace, see "Lead Smelting--No. 1," Mining and Scientific Press, 5 December 1885, 373.

12. H. O. Hofman, The Metallurgy of Lead (New York: Scientific Publishing, 1889), 426.

13. "Grip-Sack Correspondence," Dillon Tribune, 8 September 1885.

14. "Nicholia (Idaho) Items," Dillon Tribune, 10 October 1885; "Nicholia, A Lively Mining Camp," Idaho Register, 17 July 1886.

15. "Nicholia (Idaho) Cullings," Dillon Tribune, 29 October 1886.

16. "Viola Company, Limited," Engineering and Mining Journal, 23 October 1886.

17. "The Viola Company," Engineering and Mining Journal, 27 November 1886, 381-382.

18. Ibid., 382.

19. "The Viola Mining and Smelting Company," Engineering and Mining Journal, 18 December 1886, 434-435.

20. W. Turrentine Jackson, "British Capital in Northwest Mines," Pacific Northwest Quarterly 47, no. 3 (1956): 79-80.

21. "Idaho Lead-Silver Mines," Mining and Scientific Press, 24 March 1888, 182.

22. "The Viola Mine," Idaho Recorder, 14 April 1888.

23. "Shut Down," Idaho Recorder, 22 November 1888.

24. "Lemhi County," Engineering and Mining Journal, 11 August 1888, 114.

25. Jackson, "British Capital in Northwest Mines," 80.

26. Budge, letter to editors, Idaho Recorder, 29 November 1888; "Local Intelligence," Idaho Recorder, 10 January 1889; "Additional Local," Idaho Recorder, 28 March 1889.

27. "Local Intelligence," Idaho Recorder, 29 August 1889.

28. Jackson, "British Capital in Northwest Mines," 80.

29. "Delinquent Tax List," Idaho Recorder, 27 December 1888; "Delinquent Tax List," Idaho Recorder, 30 December 1891; "Delinquent Tax List," Idaho Recorder, 28 December 1892.

30. Pearl M. Oberg, "Birch Creek Kilns," Incredible Idaho (N.p., 1973), 33-34.

31. "Nicholia, A Lively Mining Camp," Idaho Register, 17 July 1886.

32. "Nicholia Letter," Idaho Recorder, 11 October 1888.

33. Idaho Recorder, 8 November 1888.

34. Philip F. Notarianni, "The Frisco Charcoal Kilns," Utah Historical Quarterly 50, no. 1 (1982): 43; Nelson Courtland Brown, Forest Products: Their Manufacture and Use (New York: John Wiley and Sons, 1919), 241-245.

35. "Nicholia, A Lively Mining Camp," Idaho Register, 17 July 1886.

36. Blackburn, "Idaho Lead-Silver Mines", 182.

37. "Nicholia (Idaho) Cullings," Dillon Tribune, 16 January 1887.

38. Notarianni, "The Frisco Charcoal Kilns," 42-43.

39. Ibid., 44.

40. Oberg, "Birch Creek Kilns," 34.

41. Emrich, Handbook of Charcoal Making, 94-97.

42. J. C. Cameron, Jr., "The Smelting Ores of Utah and Their Economic Metallurgy," Utah Mining Gazette, 25 July 1874, 381; Brown, Forest Products, 242.

43. The following description is taken from Emrich, Handbook of Charcoal Making, 24-33. See Emrich for illustrations of typical pits and earthmound kilns.

44. Emrich, Handbook of Charcoal Making, 1-5; Brown, Forest Products, 189-247.

45. Brown, Forest Products, 242.

46. Cameron, "The Smelting Ores of Utah"; Wells, Gold Camps, 103, 115, 119, 131.

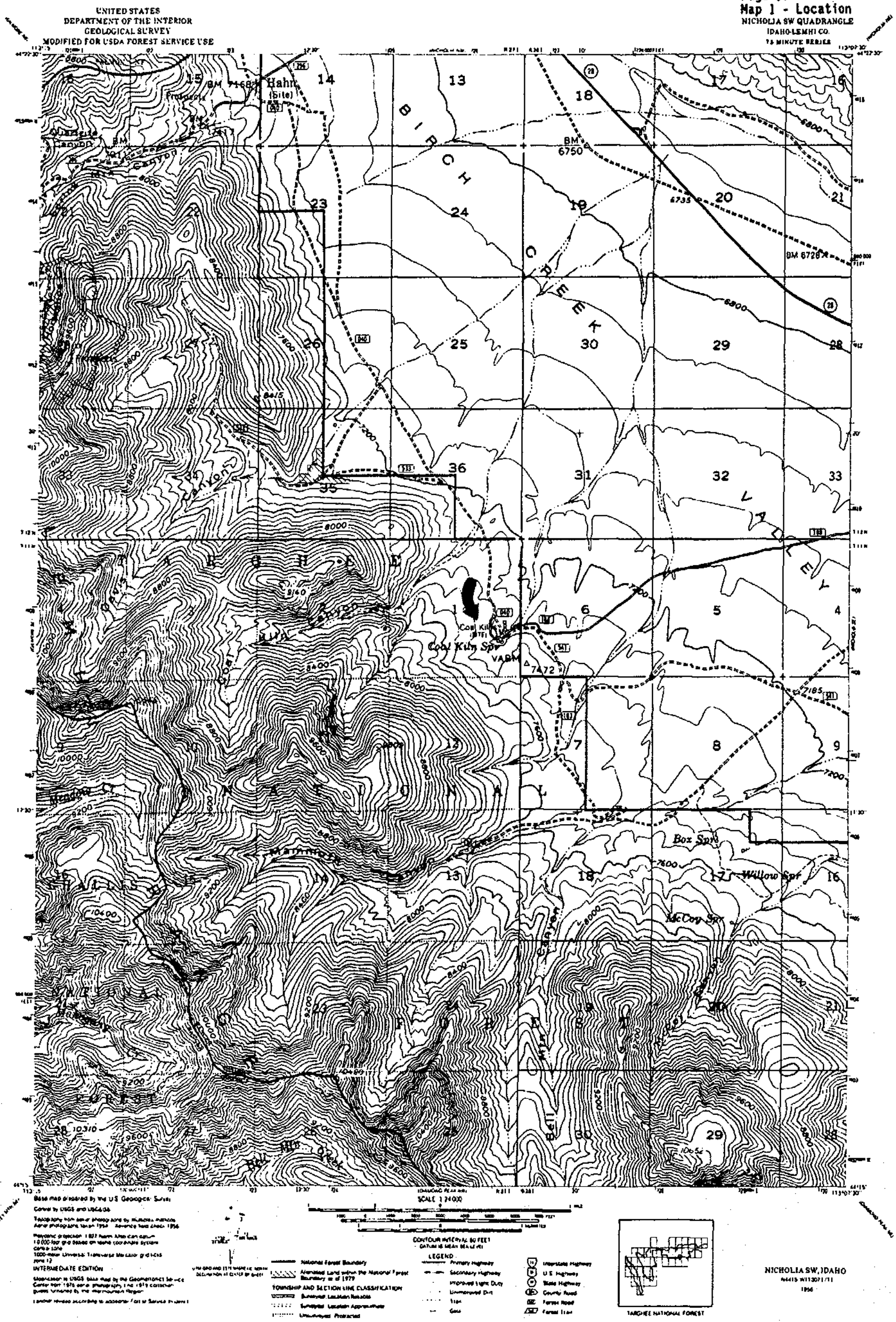
47. Rodman Wilson Paul, "Mining, metal", The Reader's Encyclopedia of the American West, ed. Howard R. Lamar (New York: Harper & Row, 1977), 733-739.

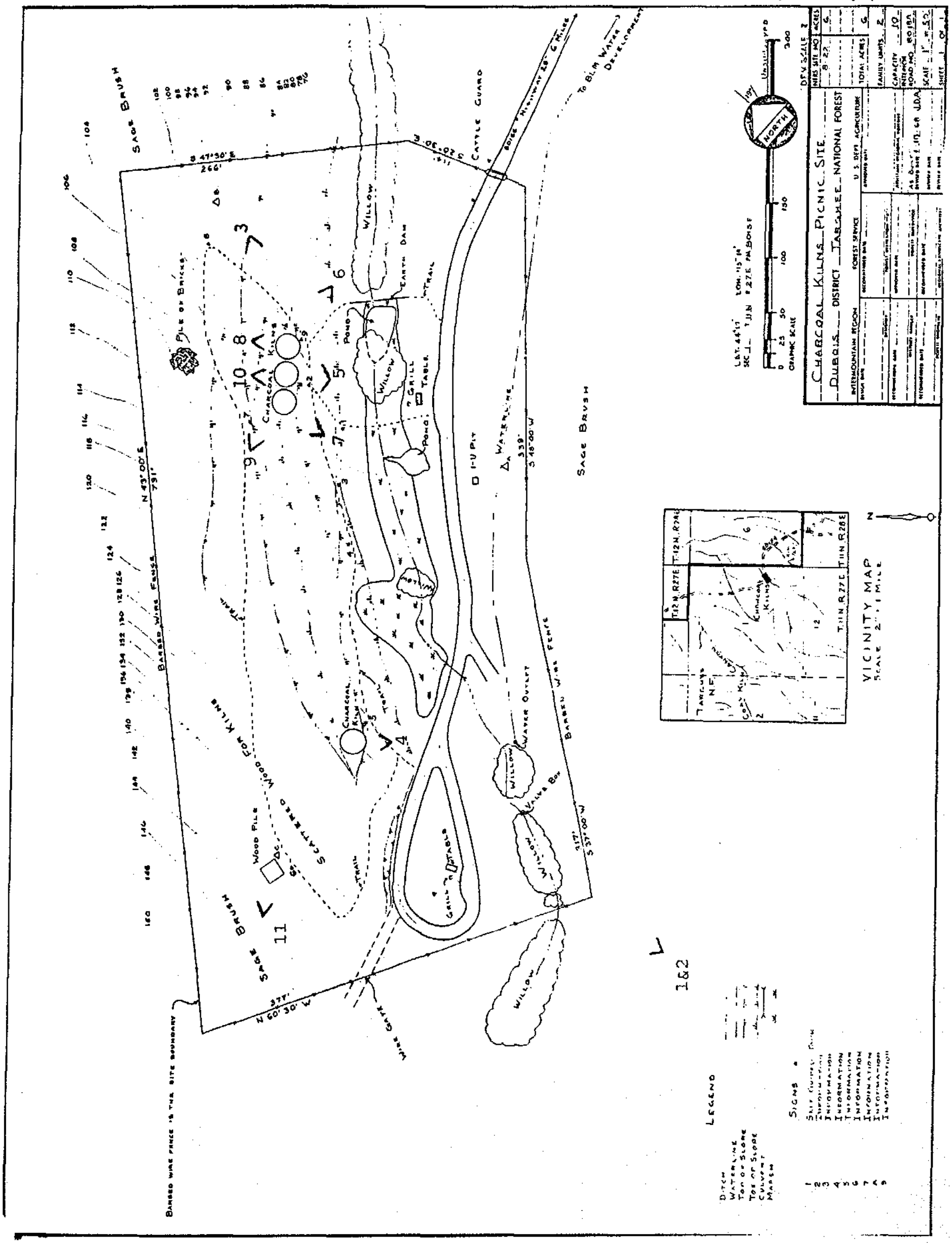
48. Wells, Gold Camps, 1, 87-88.

49. Paul, "Mining", 737-738.

50. Fiori and Walters, "Stabilization of Brick Charcoal Kilns", 19-22.

Map 1 - Location




Charcoal Kilns Picnic Site
Dubois District Targhee National Forest
Intermountain Region
Forest Service
U.S. Dept. Agriculture
North
Graphic Scale
Vicinity Map
Legend
Ditch
Waterline
Top of Slope
Toe of Slope
Culvert
Marsh
Signs
Sage Brush
Barbed Wire Fence
Cattle Guard
Pile of Bricks
Charcoal Kilns
Willow
Pond
Earth Dam
Trail
Grill
Table
Waterline
Water Outlet
Valve Box
Wood Pile
Scattered Wood for Kilns
Wire Gate
To BLM Water Development
1&2
3
4
5
6
7
8
9
10
11